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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: : Afzali-Ardakani et al.
Serial No. : 08/118,475
Filed On : September 7, 1993
For : ELECTRICALLY CONDUCTIVE
POLYMERIC MATERIALS AND
USE THEREOF.
Examiner : B. Swope
Group Art Unit : 1105



Honorable Commissioner of Patents
and Trademarks
Washington, D.C. 20231

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RESPONSE

Sir:

In response to the Office Action dated September 1, 1994, the Examiner is respectfully requested to reconsider the rejection of claims 53-81 in view of the arguments presented herein in combination with the Declaration Under 37 C.F.R. § 1.132.

In the aforementioned Office Action, the Examiner has rejected Claims 53-81 as being unpatentable over each of United States Patents 4,933,106 to Sakai et al., 4,940,517 to Wei, 5,068,060 to Jen et al. or 4,771,111 to Tieke et al. In the Office Action the Examiner has stated:

"The present claims are drawn to an electrically conductive composition containing an electrically conductive polymer and a polymer dopant, the method of making such a composition and articles formed therefrom. The electrically conductive polymer and the polymer dopant can be selected from lists of well known conductive polymers and well known polymer dopants. Each of the references listed above teach (sic) an electrically conductive composition containing an electrically conductive polymer and a polymer dopant as taught by applicant. Each reference teaches at least one embodiment of applicant's invention. While some of applicant's dependent claims recite a specific conductive polymer with a specific dopant, nothing unobvious is seen in merely selecting a conductive polymer and a polymer dopant from the lists of materials that are taught by the prior art.

Sakai discloses an electrically conductive composition, and method of making such, comprising a conductive polymer and a polymer dopant, which

can be the same as those presently claimed. See columns 2 and 3. For example Sakai teaches polypyrrole and polythiophene as polymers and teaches polyacrylic acid, polysulfonic acids and acids containing carboxylic groups as dopants. It would have been prima facie obvious for one skilled in the art to make an electrically conductive composition out of any combination of these polymers and dopants as Sakai clearly suggests that such may be done.

Wei discloses an electrically conductive composition, and method of making such, comprising polyaniline and a polymer dopant. The dopant can be polysulfonic acid or polyacrylic acid.

Jen discloses an electrically conductive composition, and a method of making such, comprising a polymer (heterocyclic vinylene) and a polymer dopant. The dopant can be by polyacrylic acid and those containing carboxylic acid or sulfonic acid groups. See abstract and column 14, lines 57-65.

Tieke discloses an electrically conductive composition comprising a mixture of polyimide and polypyrrole. See abstract examples.

While all of the references do not contain a specific example teaching an electrically conductive polymer and a polymer dopant, the suggestion to do so is clearly suggested in each patent. The skilled artisan would simply expect that the polymer dopants would produce results similar in degree to the other dopants listed and specifically demonstrated. Nothing unobvious is seen in doing so. Additionally, note that each reference teaches the shaping of the polymer material into useful articles."

In response to an Office Action in the parent application, (referred to hereinafter as "the '386 application," now abandoned), applicants filed an amendment that more clearly defined the claims by including language that clarified that the polymer blend is *--soluble in an organic solvent--*.

In an advisory action in response to the aforementioned amendment to the claims of the '386 application, the Examiner stated:

"... the Examiner suggests filing the amendment in a continuation application along with a declaration showing that the prior art blends are not soluble in the organic solvent that the present invention is."

The instant application is a continuation application of application Serial Number 07/746,386 filed August 16, 1991 now abandoned.

In response to the rejection of Claims 53-81 with respect to the above-cited references, applicants hereby incorporate by reference the remarks made in the preliminary amendment filed

September 7, 1993 that relate to the disclosures of the prior art references to Sakai, et al., Wei, Jen, et al. and Tieke, et al. To reiterate, the references to the aforementioned patentees, do not disclose a soluble composition of matter. These patents specifically state that the appropriate monomer, whether aniline, pyrrole or thiophene are polymerized in the presence of a polyacid. As the polymerization of the monomer proceeds, the polymer doped with the polymeric acid precipitates from the reaction solution.

It is well known in the art that polythiophene and polypyrrole are not soluble polymers. Thus it is clear that it is not possible to have solutions of the preformed polymer as is the case in the present invention.

Despite the differences cited by Applicants between the aforementioned prior art references and the instant invention, the Examiner persisted in the rejection and cited another 35 U.S.C. §103 rejection of obviousness by virtue of the application of United States Patent 5,006,278 to Elsenbaumer in view of Sakai, et al.

Elsenbaumer teaches solutions of polyaniline with an oxidizing dopant. This dopant is not a polyacid. As the Examiner points out on page 7 of the Office Action, Elsenbaumer teaches dopants which are small molecules, more specifically, oxidizing agents. (See page 7, line 8 et al.) More compelling however, is the fact that the Examiner impliedly recognizes that the invention is different since he states that Elsenbaumer teaches a variety of dopants. (See page 8 of the Office Action where no mention is made that the dopant is polymer, merely that the "dopants may vary widely".)

In reviewing the references cited, none disclose *a reaction product of two soluble polymers* resulting in a conducting, miscible, soluble blend. (Emphasis added.)

To establish that there is a difference in kind, rather than degree between the prior art and the instant invention, applicants performed experimental work and have summarized the results in the declaration accompanying this amendment.

In performing the experimental work, numerous samples were prepared under the conditions as set forth in the examples disclosed in the specification of the present invention. Using the teaching of the present invention, solutions of conductive polymers were prepared by forming first solutions of precursor polymers to the conductive polymers in a solvent, and forming second solutions of dopants, each in a solvent. Each of the first and second solution samples were combined. In each trial, the dopant dopes the precursor to the conductive polymers which in each case remains in solution in the combined solvent.

Applicants believe that if the doped polymers of the present invention were to be synthesized by the methods disclosed in United States Patents 4,933,106 to Sakai et al., 4,940,517 to Wei, 5,068,060 to Jen et al. or 4,771,111 to Tieke et al., (which are basically *in-situ* polymerizations of the monomer in the polyacid), the conducting polymer blend will precipitate out of solution as a powder.

Applicants as a result of the experiments performed, that once the polymer precipitates out in this fashion, it does not subsequently dissolve to any appreciable extent in an organic solvent.

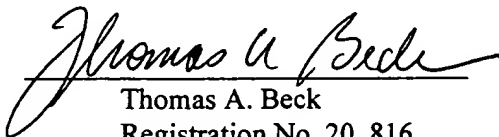
Applicants declare in the declaration that they have determined that with respect to the present invention, at no time does the conducting polymer blend precipitate from solution. That is, the precursor polymer (the conducting polymer in undoped form) and the polyacid are both soluble in a given solvent. The reaction of the two is carried out in solution, and the product, which is the conducting polymer remains soluble in the given solvent. This result is clearly different from and unobvious in view of the prior art.

Applicants conclude in their declaration that the Elsenbaumer reference is not pertinent. As noted above, Elsenbaumer teaches solutions of polyaniline with an oxidizing dopant; however the dopant is not a polyacid, but is in fact a collection of compounds possessing small molecules.

As a result of the arguments presented herein as supported by the accompanying Declaration Under 37 C.F.R. §1.132, allowance of claims 53-81 is respectfully requested.

Respectfully Submitted,

Dated: February 21, 1995

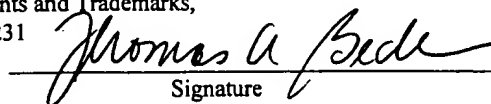


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MAILING CERTIFICATE

Date of Deposit: February 21, 1995

I hereby certify that this amendment with fee is being deposited with the United States Postal Service under 37 CFR §1.10 on the date indicated above and is addressed to the Commissioner of Patents and Trademarks, Washington, D.C. 20231
Thomas A. Beck
Sender


Signature

870-117 GP 1105

| AMENDMENT TRANSMITTAL LETTER | | | Docket No. IBM-109A |
|---|----------------------------------|----------------------|------------------------|
| Serial No 08/118,475 | Filing Date September 7, 1995 | Examiner B. Swope | Group Art Unit 1105 |
| Inventor(s) Afzali-Ardakani et al. | | | |
| Title Electrically Conductive Polymeric Materials and Use Therof | | | |

To The Commission of Patents and Trademarks:



Transmitted herewith is an amendment in the above identified application.

Small entity status of this application under 37 CFG 1.27 has been established by a verified statement previously submitted.

A verified statement to establish small entity status under 37 CFG 1.9 and 1.17 is enclosed.

☒ A 3 month extension of time is requested. The extension fee of \$ 870 is enclosed by separate check or is included in the check enclosed for \$ 870.00

☒ No. additional fee is required.

☐ The fee has been calculated as shown below:

☐ Other

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| | Claims Remaining after amendment | | Highest No. Previously paid for | Present Extra | | Rate | Addition al Fee | OR | Rate | Additiona l Fee |
|--|-------------------------------------|-------|------------------------------------|------------------|--|----------|--------------------|----|----------|--------------------|
| Total | | Minus | | | | x\$10 = | \$ | | x\$20 = | \$ |
| Indep | | Minus | | | | x\$36 = | \$ | | x\$72 = | \$ |
| First Presentation of Multiple Dep Claim | | | | | | x\$110 = | \$ | | x\$220 = | \$ |
| | | | | | | Total | \$ | OR | Total | \$ |

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☐ A check in the amount of \$ to cover the filing fee is enclosed.

☐ The Commissioner is hereby authorized to charge payment of the following fees associated with this communication or credit any overpayment to Deposit Account No. 25-0350. A duplicate copy of this sheet is enclosed.

☐ Any Additional filing fees required under 37 CFR 1.16.

☐ Any patent application processing fees under 37 CFR 1.17.

February 21, 1995
(Date)

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I hereby certify that this paper is being deposited
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Thomas A. Beck February 21, 1995
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